

WHAT IS CLAIMED IS:

- 1 1. A method for loading a preservative into blood platelets comprising:
2 providing a preservative solution having a preservative, water and protein; and
3 loading blood platelets with the preservative solution to produce preservative-
4 loaded blood platelets, wherein said preservative solution generally has higher glass transition
5 temperatures than glass transition temperatures for a preservative solution having the
6 preservative, water and no protein.
- 1 2. The method of Claim 1 wherein said preservative solution in said
2 preservative-loaded blood platelets comprises a gradient of the glass transition temperature
3 (degrees C) to a water content (grams of water per gram of dry weight of preservative and
4 protein) ranging from about 50 to about 900 at a water content of less than about 0.40 grams
5 of water per gram of dry weight of preservative and protein.
- 1 3. The method of Claim 1 wherein said glass transition temperature of
2 said preservative solution in said preservative-loaded blood platelets solution increases at a
3 water content of less than about 0.40 grams of water per gram dry weight of preservative and
4 protein.
- 1 4. The method of Claim 1 wherein said preservative solution in said
2 preservative-loaded blood platelets comprises a greater rate of glass transition temperature
3 per water content (weight of water per dry weight of preservative and protein) increase at a
4 water content of less than about 0.25 grams of water per gram dry weight of preservative and
5 protein than at a water content greater than about 0.25 grams of water per gram dry weight of
6 preservative and protein.
- 1 5. The method of Claim 1 wherein said preservative solution in said
2 preservative-loaded blood platelets comprises a greater rate of glass transition temperature
3 per water content (weight of water per dry weight of preservative and protein) increase at a
4 water content of less than about 0.15 grams of water per gram dry weight of preservative and
5 protein than at a water content of greater than about 0.15 grams of water per gram dry weight
6 of preservative and protein.
- 1 6. The method of Claim 1 wherein said preservative solution in said
2 produced preservative-loaded blood platelets generally has said higher glass transition

3 temperatures at a water content (weight of water per dry weight of preservative and protein)
4 of less than about 0.25 grams of water per gram dry weight of preservative and protein.

1 7. The method of Claim 1 wherein said preservative comprises an
2 oligosaccharide.

1 8. The method of Claim 7 wherein said oligosaccharide is trehalose.

1 9. The method of Claim 1 wherein said preservative-loaded blood
2 platelets comprise a water content ranging from about 0.02 grams of water per gram of dry
3 weight of preservative and protein to about 0.40 grams of water per gram of dry weight of
4 preservative and protein.

1 10. The method of Claim 1 wherein said preservative-loaded blood
2 platelets comprise a water content ranging from about 0.15 grams of water per gram of dry
3 weight of preservative and protein to about 0.40 grams of water per gram of dry weight of
4 preservative and protein.

1 11. The method of Claim 1 wherein said protein is albumin.

1 12. The method of Claim 1 wherein said albumin is bovine albumin.

1 13. The method of Claim 1 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 preservative and protein) ranges from about 50 to about 900 at a water content of less than
4 about 0.30 grams of water per gram of dry weight of preservative and protein.

1 14. The method of Claim 1 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 preservative and protein) ranges from about 50 to about 900 at a water content ranging from
4 about 0.02 to less than about 0.40 grams of water per gram of dry weight of preservative and
5 protein.

1 15. The method of Claim 1 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 preservative and protein) ranges from about 100 to about 800 at a water content ranging from
4 about 0.15 to about 0.30 grams of water per gram of dry weight of preservative and protein.

1 16. The method of Claim 1 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 preservative and protein) ranges from about 50 to about 150 at a water content ranging from
4 about 0.20 to about 0.30 grams of water per gram of dry weight of preservative and protein.

1 17. The method of Claim 1 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 preservative and protein) ranges from about 75 to about 125 at a water content ranging from
4 about 0.20 to about 0.30 grams of water per gram of dry weight of preservative and protein.

1 18. The method of Claim 1 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 preservative and protein) ranges from about 700 to about 900 at a water content ranging from
4 about 0.15 to about 0.20 grams of water per gram of dry weight of preservative and protein.

1 19. The method of Claim 1 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 preservative and protein) ranges from about 750 to about 850 at a water content ranging from
4 about 0.15 to about 0.20 grams of water per gram of dry weight of preservative and protein.

1 20. The method of Claim 1 wherein said preservative solution comprises
2 said preservative and said protein in a weight ratio ranging from about 0.25 grams to about
3 1.75 grams of preservative per each gram of protein.

1 21. The method of Claim 1 wherein said preservative solution comprises
2 said preservative and said protein in an approximate 1:1 weight ratio.

1 22. The method of Claim 1 wherein said preservative-loaded blood
2 platelets have said higher glass transition temperatures.

1 23. The method of Claim 9 wherein said preservative-loaded blood
2 platelets have said higher glass transition temperatures.

1 24. Blood platelets produced in accordance with the method of Claim 1.

1 25. A platelet composition comprising

2 blood platelets having a preservative solution including a preservative, water,
3 and protein, and generally having higher glass transition temperatures than glass transition
4 temperatures for blood platelets loaded with the preservative, water, but no protein.

1 26. The composition of Claim 25 wherein said blood platelets comprise a
2 gradient of the glass transition temperature (degrees C) to a water content (grams of water
3 per gram of dry weight blood platelets) ranging from about 50 to about 900 at a water content
4 of less than about 0.40 grams of water per gram of dry weight blood platelets.

1 27. The composition of Claim 25 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 blood platelets) ranges from about 50 to about 150 at a water content ranging from about 0.20
4 to about 0.30 grams of water per gram of dry weight of blood platelets.

1 28. The composition of Claim 25 wherein the gradient of the glass
2 transition temperature (degrees C) to the water content (grams of water per gram of dry
3 weight preservative) ranges from about 75 to about 125 at a water content ranging from about
4 0.20 to about 0.30 grams of water per gram of dry weight preservative.

1 29. The composition of Claim 25 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 blood platelets) ranges from about 700 to about 900 at a water content ranging from about
4 0.15 to about 0.20 grams of water per gram of dry weight of blood platelets.

1 30. The composition of Claim 25 wherein a gradient of the glass transition
2 temperature (degrees C) to the water content (grams of water per gram of dry weight of
3 blood platelets) ranges from about 750 to about 850 at a water content ranging from about
4 0.15 to about 0.20 grams of water per gram of dry weight of blood platelets.

1 31. The composition of Claim 25 wherein said preservative comprises an
2 oligosaccharide.

1 32. The composition of Claim 31 wherein said oligosaccharide is
2 trehalose.

1 33. The composition of Claim 25 wherein said protein comprises albumin.

1 34. A process for processing blood platelets comprising:
2 providing a preservative solution having a preservative, water, and protein;
3 suspending blood platelets in the preservative solution at a concentration
4 greater than about 10^8 platelets per ml. of preservative solution to produce preservative-
5 loaded blood platelets;
6 freeze-drying the preservative-loaded blood platelets; and
7 recovering at least 75% of the freeze-dried platelets.

1 35. The process of Claim 34 wherein said preservative solution comprises
2 from about 60 mM to about 240 mM of said preservative and from about 2% by weight to
3 about 8% by weight of said protein.

1 36. The process of Claim 34 wherein said concentration ranges from about
2 0.5×10^9 platelets per ml preservative solution to about 10.0×10^9 platelets per ml
3 preservative solution.

1 37. The process of Claim 34 wherein said concentration ranges from about
2 0.5×10^9 platelets per ml preservative solution to about 10.0×10^9 platelets per ml
3 preservative solution, and said recovering includes recovering at least 85% by weight of the
4 freeze-dried platelets.

1 38. The process of Claim 34 additionally comprising storing, prior to
2 recovering, the freeze-dried platelets.

1 39. A process for preserving protein structure in blood platelets
2 comprising:
3 providing a preservative solution having a preservative, water and protein;
4 loading blood platelets with the preservative solution to produce preservative-
5 loaded blood platelets;
6 dehydrating the preservative-loaded blood platelets while maintaining a
7 residual water content in the blood platelets equal to or less than about 0.30 gram of residual
8 water per gram of dry weight blood platelets to preserve protein structure of the blood
9 platelets upon rehydrating after storage;
10 storing the dehydrated preservative-loaded blood platelets; and

11 rehydrating the stored dehydrated preservative-loaded blood platelets with
12 water vapor to preserve protein structure of the blood platelets.

1 40. The process of Claim 39 wherein said rehydrating the stored
2 dehydrated preservative-loaded blood platelets with water vapor comprises increasing the
3 water content of the preservative-loaded blood platelets until the preservative-loaded blood
4 platelets have a water content equal to or less than about 0.30 grams of water per gram of dry
5 weight blood platelets.

1 41. The process of Claim 39 additionally comprising directly hydrating
2 with bulk water the rehydrated preservative-loaded blood platelets.

1 42. A dehydrated composition for mammalian therapy comprising:
2 freeze-dried platelets comprising a preservative solution for preserving
3 biological properties during freeze-drying and rehydration, wherein said preservative solution
4 includes water, protein, and a preservative, and said platelets are rehydratable so as to have a
5 normal response to at least one agonist.

1 43. The dehydrated composition of Claim 42 wherein said normal
2 response to at least one agonists includes a response to thrombin in a physiological
3 concentration commencing at thrombin concentrations ranging from about 0.1 U/ml to about
4 1.0 U/ml, and wherein between thrombin concentrations ranging from about 0.2 U/ml to
5 about 0.70 U/ml, percent(%) aggregation of the rehydrated platelets ranges from about 20%
6 to about 80%.

1 44. The dehydrated composition of Claim 42 wherein said normal
2 response to at least one agonists includes a response to ristocetin in a physiological
3 concentration commencing at ristocetin concentrations ranging from about 1.0 mg/ml to
4 about 10.0 mg/ml.

5
1 45. The dehydrated composition of Claim 42 wherein said normal
2 response to at least one agonists includes a response to ristocetin in a physiological
3 concentration and between ristocetin concentrations ranging from about 2.0 mg/ml to about
4 10.0 mg/ml, percent(%) aggregation of the rehydrated platelets ranges from about 10% to
5 about 100%.

1 46. The dehydrated composition of Claim 42 wherein said normal
2 response to at least one agonists includes a response to ristocetin in a physiological
3 concentration and between ristocetin concentrations ranging from about 3.5 mg/ml to about
4 9.0 mg/ml, percent(%) aggregation of the rehydrated platelets typically ranges from about
5 40% to about 90%.

1 47. The dehydrated composition of Claim 42 wherein said normal
2 response to at least one agonists includes a response to ristocetin in a physiological
3 concentration and between ristocetin concentrations ranging from about 4.0 mg/ml to about
4 7.0 mg/ml, percent(%) aggregation of the rehydrated platelets ranges from about 60% to
5 about 80%.

1 48. A process for loading a preservative into blood platelets comprising:
2 providing a preservative solution having a preservative, water and protein;
3 disposing platelets in the preservative solution for loading the preservative
4 from the preservative solution into the platelets to produce preservative-loaded blood
5 platelets wherein said preservative solution generally has higher glass transition temperatures
6 than glass transition temperatures for a preservative solution having the preservative, water
7 and no protein; and
8 preventing a decrease in a loading efficiency gradient in the loading of the
9 preservative into the platelets.

1 49. The process of Claim 48 wherein said preservative comprises an
2 oligosaccharide and said preventing a decrease in a loading efficiency gradient in the loading
3 of the oligosaccharide into the platelets comprises maintaining a concentration of the
4 oligosaccharide in the oligosaccharide solution below about 50 mM.

1 50. The process of Claim 48 wherein said loading comprises loading by
2 fluid phase endocytosis.

1 51. The process of Claim 49 wherein said loading comprises loading by
2 fluid phase endocytosis.

1 52. The process of Claim 48 wherein said preservative comprises an
2 oligosaccharide and said preventing a decrease in a loading efficiency gradient in the loading

3 of the oligosaccharide into the platelets comprises maintaining a positive gradient of loading
4 efficiency to concentration of the oligosaccharide in the oligosaccharide solution.

1 53. The process of Claim 48 wherein said preservative comprises an
2 oligosaccharide and said preventing a decrease in a loading efficiency gradient in the loading
3 of the oligosaccharide into the platelets comprises maintaining a positive gradient of loading
4 efficiency (%) to concentration (mM) of the oligosaccharide in the oligosaccharide solution.

1 54. The process of Claim 52 wherein said oligosaccharide is trehalose.

1 55. The process of Claim 53 wherein said oligosaccharide is trehalose.

1 56. A process for loading a preservative into blood platelets comprising:
2 providing a preservative solution having a preservative, water and protein;
3 disposing platelets in the preservative solution for loading the preservative
4 from the preservative solution into the platelets to produce preservative-loaded blood
5 platelets wherein said preservative solution generally has higher glass transition temperatures
6 than glass transition temperatures for a preservative solution having the preservative, water
7 and no protein; and
8 preventing a decrease in a loading gradient in the loading of the
9 oligosaccharide into the platelets.

1 57. The process of Claim 56 wherein said preservative comprises an
2 oligosaccharide and said preventing a decrease in a loading gradient in the loading of the
3 oligosaccharide into the platelets comprises maintaining a concentration of the
4 oligosaccharide in the oligosaccharide solution below about 50 mM.

1 58. The process of Claim 56 wherein said preservative comprises an
2 oligosaccharide and said loading comprises loading by fluid phase endocytosis.

1 59. The process of Claim 57 wherein said loading comprises loading by
2 fluid phase endocytosis.

1 60. The process of Claim 56 wherein said preservative comprises an
2 oligosaccharide and said preventing a decrease in a loading gradient in the loading of the
3 oligosaccharide into the platelets comprises maintaining a positive gradient of concentration

4 of oligosaccharide loaded into the platelets to concentration of the oligosaccharide in the
5 oligosaccharide solution.

1 61. The process of Claim 60 wherein said oligosaccharide is trehalose.

1 62. A method for preserving platelets, said method comprising
2 providing solute-loaded platelets, and
3 drying the platelets in an iso-osmotic freeze drying solution to produce dried
4 solute-loaded platelets.

1 63. A method of claim 62, wherein said dried platelets are rehydrated,
2 without prehydration.

THIS PAGE BLANK (USPTO)